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# AGRICULTURAL NOTES

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## A BUILDING MATERIAL.

By D. W. May.

The time was when we produced our own building materials in Porto Rico. They consisted first of palm leaves, later of the trunks of palms, and finally of native timber cut or sawn into boards. Except for the leaves and sections of the outer trunk of palms, native building materials are not now available. Even the bricks and roofing tiles which we formerly made are not manufactured now because of the cost of fuel for burning. Practically all of the roofing materials used at the present time, such as galvanized iron and tarred products are imported. All lumber used now as building material is imported, brought in by sailing vessels from South Atlantic and Gulf ports of the United States. Large quantities of cement, which in concrete is taking the place of bricks and mortar, are shipped into Porto Rico from the United States and foreign countries. Sand and gravel, the main constituents of concrete, are to be had in many sections of Porto Rico but when they are not near at hand the transportation cost is often excessive.

There is another available building material quite common in many sections of island that can be utilized in building permanent homes, farm buildings and ware-  
~~This is the soft limestone rock or coral deposit known locally as "tosca".~~  
is found in a wide strip running east and west on both the north and south slopes of Porto Rico. Outcroppings occur in many other places and it may be secured in any locality without an excessive charge for haulage, if the place where it is to be used is near the railroad. These deposits of tosca are often very extensive and as in an area west of Ponce, there are mountains of it. On the north side it is very evident between Manatí and Vega Alta as limestone hills, often of sugar-loaf type, standing up in the plains. Disintegrated and mixed with vegetable matter it forms one of our best types of soil. Where exposed to the air, a hard crust is formed, but after breaking through this it may be cut with a spade. It is sometimes used as a fertilizer and is very effective where an acid condition of the soil is found. It is used to considerable extent as road surfacing material, as on the highway between Camuy and Aguadilla. It is also used on the railroad as ballast for the tracks, making a reasonably hard surface, and, on packing, preventing the growth of vegetation, which would have to be cut with machete.

This tosca is made up in a large part of calcium carbonate. The lime content (CaO) of a sample from Aguadilla was 44.6 per cent calcium oxide. One from Quebradillas 46.8 per cent. A complete analysis of two samples showed the following composition:







Sand and Silica	Loss on Ignition	Lime CaO.	Magnesium MgO	Ferric Oxide $\text{Fe}_2\text{O}_3$
1.47	43.39	53.76	0.87	0.56
5.19	41.72	50.65	.77	1.09

We made a series of experiments with this material, using cement as a hardening or setting substance. The mixtures varied from 1 to 5 to 1 to 20 cement to tosca by volume. It sets readily and in a proportion of 1 cement to 10 of tosca has a breaking strength of 730 pounds. This compares with the breaking strength of 1350 pounds for concrete made of local materials, cement 1, sand 2, gravel 4. The mixture sets well and if smooth forms are used requires no further treatment inside or outside of houses. The color is of a light yellow. It mixes and pours as readily as ordinary concrete made of cement, sand and gravel. The cost of handling same is equal. Its economy, compared with concrete, lies in the fact that about half the amount of cement, the expensive element of the mixture, is necessary. Also in many cases the tosca is near at hand and much cheaper and more easily obtained than sand and gravel or rock. In a house built at the Station, 33 feet by 38 feet, with 8-inch walls and partitions, 36 barrels of cement were required.

As the tosca varies chemically as found in different sections of the island, before undertaking the erection of a building of any size, it is advisable to make some preliminary studies of the mixture with cement. This can be readily done in small amounts, carefully measuring the ingredients and allowing the blocks to harden for a few days. We found a mixture as low as 1 to 20 will harden but this is not recommended except for small buildings or those of a temporary nature. However, a mixture of 1 part cement to 10 of the tosca seems strong enough for ordinary purposes and able to withstand the action of the elements for indefinite periods.

With this material so abundant in the island it ought to be utilized to a great extent in relieving the shortage of houses that exists here. Not only can homes of permanence be constructed of this material, but as it lends itself to being moulded into various forms, houses of architectural beauty and elaborate design can be built of it.



